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WASTE.

WE have most of us heard the rhyme—

Dearly beloved brethren, it really is a sin,
When you peel potatoes, to throw away the skin;
For the skins feed the pigs, and the pigs feed you,
Dearly beloved brethren, is not this quite true?

Though as a poetical effort this is hardly in the first rank, it teaches a more or less useful moral—namely, that everything has a use, if that use can only be found, and therefore nothing ought to be wasted, however trifling it may seem. But then, again, there are certain kinds of waste which are absolutely unavoidable—and this is particularly the case with that from the national coinage.

With reference to this, a somewhat curious experiment was made some time ago on London mud. An American scientist took samples of mud from various streets in the Metropolis, with a view to finding out how they differed in composition, and the analyses gave most interesting results. Mud taken from the busiest parts of the city showed in its composition quite an appreciable amount of gold and silver, besides copper, tin, iron, and other metals, with a fair proportion of fibrous animal matter, but very little vegetable fibre. In mud from the poor districts, however, where there was very little traffic, vehicular or otherwise, the most delicate tests failed to reveal even traces of gold, and showed but very minute quantities of silver. Indeed, metal of any sort was very scarce, with the exception of iron and copper; whilst the quantity of animal matter was a quarter of that contained in City mud. Curiously enough, however, the vegetable matter was present in quadrupled proportions.

Results such as these are liable to set one thinking. All this gold, silver, copper, iron, tin, &c., must of necessity be waste, and it comes from horse-shoes, tyres of carts, brass fittings, &c., which wear out on the streets. But horses are not shod with precious metals—neither do gold nor silver enter into the com-

position of carts and carriages. They can, therefore, only come from two sources—the wearing out of jewellery, and of the national coinage. Jewellery, however, does not wear much—a ring or a watch chain will not lose a grain in weight with five years' constant use—so that we may eliminate jewellery, and take it that it is the wearing out of the gold and silver currencies which makes true the saying that the streets of London city are paved with gold. If this be so, it is not unreasonable to suppose that gold and silver are spread in minute quantities all over the surface of this country, and so it might be interesting to know how much precious metal is worn from the currency daily, and spread over the land in an impalpable dust.

Statistics from the Royal Mint show that the average cost of renewing the silver coinage averages £31,000. This represents about six tons of silver, which are spread over the United Kingdom yearly. In other words, the daily unavoidable waste from the silver coinage is nearly £86 sterling.

Gold is not so much used as silver, but its waste in this way is sufficiently lamentable. The Mint issues, on an average, 4,645,521 sovereigns, and twice that number of half-sovereigns, yearly. The weight lost by fair wear and tear in the first is .0396 grains per annum, and in the second .0551 grains. Should any one care to work out this sum, he will find that this wear, if it could be collected and coined, would give sufficient gold to make sixteen sovereigns every day! Is it wonderful, therefore, that mud, taken from a part of London which has for centuries been the resort of moneyed men of business, should contain a certain quantity of the precious metals?

Yet the waste from the currency is quite insignificant when compared with that which takes place every day in eatables and drinkables. Take bread, for example. Roughly speaking, there are sixty million pounds of bread baked in Great Britain daily, and of this, at a very low computation, half an ounce per pound is

thrown away in crumbs, leavings, &c. Reduce this, and it will be seen that there are wasted every day one and three-quarter million pounds of bread, or enough to make nearly half a million quartern loaves, the value of which would be close upon ten thousand pounds.

Still greater, proportionally, is the waste in condiments. Mustard is wasted to the extent of fifty per cent.—that amount being generally left upon the edge of the consumer's plate, to be removed by the dish-washer, whilst that used for mustard plasters, though it could be, is never used more than once. To obtain absolutely correct figures respecting this relish is, of course, an impossibility, but the value of its diurnal waste is considerably over eighty pounds—taking it at a very moderate computation.

Vinegar, again, is thrown away in quantity—chiefly in the shape of pickle liquor. Thousands of gallons of this condiment are used every day in pickling, but not one person in a thousand ever uses this. It is thrown down the sink when all the solid matter has been extracted from the jar; whilst if it were kept and used, as it could be in nine cases out of ten, as vinegar, upon which it is an improvement, a matter of five hundred pounds or more might be saved daily.

Somewhat smaller is the sum which represents the sugar wasted by being left in the bottoms of teacups, and in sugar-basins as dust. Still, eighty pounds per diem is by no means a sum to be despised.

Salt is good—we have high authority for so saying—but were it as expensive as bread, and wasted to the same extent as that commodity, big fortunes would be wasted every day. As it is, the value of its diurnal waste is in the neighbourhood of a hundred pounds, for it is left on the edge of the plate, and otherwise wasted to even a greater extent than mustard.

A pair of utilities, if the expression may be allowed, which give excellent opportunities for waste, as everybody who keeps a housemaid knows to his cost, are coals and gas. England's output of the former is enormous, somewhere about 190 million tons annually, and the value of this is approximately 142 million pounds. At a low computation, half of this coal is used for firing purposes, and at least twenty per cent. of it is wasted in dust and cinders. It is, in all conscience, bad enough to watch the heaving overboard of tons of perfectly burnable cinders from an ocean liner, but this waste is more or less excusable, because speed is the great thing in these cases. But the housemaid who every morning throws into the dust-bin from five to ten pounds of good, solid, burnable coke, has no such excuse—it is sheer laziness, and carelessness of property not her own—and were the mistress to insist upon the cinder-sifter being used, she would find her coal-bill for the year reduced by at least twenty-five per cent., perhaps by more.

There are three distinct methods of wasting gas. The first and most usual is by turning on the jet without having a readily lighted match to apply to it. This wastes perhaps only a few cubic inches of gas; but these cubic inches multiplied by the several millions or hundreds of millions of gas jets which are nightly ignited

in this way, swell the amount of waste enormously for Great Britain. The second method is by having the gas turned on so fully that it flares. The idea is that a better light is thus obtained, but this is a mistake. If the jet be turned down until there is a clear and steady flame, there will be much more light, and considerably less gas burned. The third method of wasting gas is through a burner being alight when there is absolutely no necessity for it, and this, with the other methods, brings the nightly waste of gas in the United Kingdom up to about £500, four hundred and fifty of which might be saved.

Were potatoes peeled in a scientific manner—that is, scraped, they would afford at least five per cent. more nourishment than they do when peeled by the method which obtains with the modern cook, especially when it is taken into consideration that the most nourishing part of this tuber lies next the skin. The total consumption of potatoes for Great Britain reaches about 2000 pounds worth daily—five per cent. is wasted—that is, if the peelings mentioned above be thrown to the pigs, they would consume a hundred pounds worth of human nourishment every day.

A witty member of Parliament once said that the honest British workman had three characteristics which might be called the three 'B's,' these being 'beer, blasphemy, and baccy,' and these three B's afford two instructive examples of waste.

According to statistics, 138 million pounds are annually spent in drink in Great Britain. Say half of this is consumed in the country, and that is putting it low. Now everybody knows that when a glass of beer is drunk in one of those highly convenient establishments which are so largely patronised by the *élite* of the East End on bank holidays, and at other times, there is always a little, maybe only a few drops, or perhaps an inch of liquor left in the glass. This, with froth, drippings, and spillings, amounts to half a pint in the gallon for beer, and about an eighth of that for spirits. That is, over five per cent. of beer is wasted, and about six-eighths of one per cent. of spirits—the average being about three per cent. The whole sum, therefore, when worked out, shows that in the various 'wanities' consumed daily, there is a waste amounting in value to close on £6500.

Blasphemy not being a marketable commodity, it is impossible to put a monetary value upon the amount of it created daily, so we must pass to the third B—'baccy.' A French firm of cigarette paper manufacturers sends into England daily an average of two hundred gross books of a particular brand of cigarette paper, and it is not unreasonable to suppose that these are consumed—to say nothing of twenty or thirty other brands of papers, and made cigarettes. Now about a third of a cigarette is usually thrown away as 'butt.' We know that sixty papers go to a book, and about thirty self-made cigarettes go to the ounce, so that the amount of tobacco wasted daily in these luxuries can be approximated. About a thousand gross is the quantity of papers imported daily and smoked, and there are thrown away from these ninety-six thousand ounces of tobacco—equal in value to close upon

sixteen hundred pounds. Nor is this all, by any means, for cigar stumps and 'plugs' from pipes are not taken into consideration at all, nor the dust left at the bottom of the pouch, and which nine cigarette smokers out of ten will throw away. Add on all this, and the figure for the waste of tobacco comes to a million pounds yearly! perhaps more. This is vouched for by Sir Michael Hicks-Beach, who, in his recent Budget speech, said that no less a sum than a million sterling was thrown into the gutter every year in the shape of unused cigar and cigarette ends. These figures may appear incredible, but it must be taken into consideration that the duty on tobacco is on the dry leaf as a rule, and that the prepared materials contain nearly thirty per cent. of water. It must also be remembered that smoking has now become so common amongst all classes, that one can almost paraphrase Horace's words, and say, 'Learned and unlearned, old and young, they all smoke tobacco.'

THE MASTER CRAFTSMAN.*

CHAPTER XX.—WHAT IS ON HIS MIND?

NEVER before, I am quite sure, was transformation more rapid than that which changed the Hon. Member for Shadwell, in less than six months, from a man out of the world to a man in the world. In April he came to my chambers and introduced himself: before the end of the season he was in the House, in a West-End Club, in Society. He had shown—well, signs of promise: he knew a good many people: he was listened to in the House: he wrote a paper in the *Vacation* about some branches of the Labour Question to the *Contemporary Review*: he also read a paper on some statistics before a learned society: he attended in August a Congress of working-men, and told them truths. I believe that he distributed prizes at a Sunday-school in his borough. In one way or another, the papers were continually talking about him. Now the first step in the noble art of getting on, is to keep your name well before the public: everybody understands that: you must make people talk about you: and since people's memories are most miserably short, you must do something else, very soon, to make them talk about you again. The effect of this forced familiarity is, that when the promotion comes, nobody is in the least astonished. I think, for my own part, that he was artfully and secretly managed all this time: I have my suspicions as to the person who pulled the strings. As for himself, he was incapable of *réclame*! The people who pulled the strings, and made him dance, and made the world talk about him, sat in the background or in the underground. Nobody knows what an enormous political cellarage there is!

This was his life: it changed him completely in six months. He was always a man of presence. He was now in appearance a gentleman of sixteen quarters, at least: the aris-

toocracy of Castile could produce no scion of nobler figure. Any one, however, may have the appearance of a gentleman. Robert had acquired, in addition, something of the manner of one who has always lived with gentlefolk, so that their manners have become his own by a kind of instinct. I suppose he acquired these manners easily because he had so little to unlearn. A man who has lived alone among books can hardly have incurable habits. I do not say that he talked as a man of his age belonging to public school life, college life, or the army, would talk. No outsider can possibly acquire that manner of speech.

'Your cousin, George,' said Frances, 'reminds me of a certain courteous gentleman of Virginia whom I met some years ago. There was an old-world courtesy about him; he was a gentleman, but not of our stamp; he was conscious of his rank and manners; he thought very highly of both; and I should say that he lived among people very much unlike him. Robert reminds me of him. Nobody would deny that he is a man of fine, of rather studied manners; nobody would deny that he is a gentleman, yet not one of us. He is to spend a fortnight with me at *Beau Séjour*'—this was her country-house—'in September. He grows apace, George.'

'He is a lucky man, Frances. You have taken him up, and advanced him.'

'He is more than lucky. Anybody may be lucky. He is strong.'

When the House rose, about the third week of August, and all the world went out of town, he came home to the house and the dockyard. I looked to see him fall back upon the old life, work in the yard all day, and sit in his study all the evening. He did nothing of the kind; he moved about restlessly, he came to the yard and looked at the work in progress but without interest; he received the ordinary business communications without interest: he had still a share in the house, but he behaved as if he no longer cared even to hear what was done. I suppose he had grown out of the work. Strange. Just as I was growing into it, feeling the sense of struggle and competition which gives its living interest to every form of trade.

One day he was sitting in the yard, looking out upon the river. The men had gone; it was past five o'clock. The day was cloudy, and a driving rain fell upon the river, which looked gray, and stormy, and threatening.

'This is a horrible place to live in,' he said abruptly. 'It is more horrible than it used to be.'

'Come, you lived in it yourself for a long time.'

'But I always knew that it was a horrible place; one couldn't help knowing that. I always intended to get away. Man! if I had known only a tenth part of the pleasures of that other life, I should have been devoured with the rage and fierceness of discontent. I say it is a horrible place—cribbed, cabined, and confined. With whom can you talk? With the Captain. And Isabel. George, how can you do it? How could you bring yourself to do it? You who know the other life. I don't understand it. You that knew that incompar-

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able woman. Why, now that I do know it, rather than leave it, I would go out and rob upon the highway.'

'You like that other life so much! Strange!'

'Why is it strange? It is the only life worth leading. You taught me to like it when you taught me what it meant. I should otherwise have been outside everything all my life.'

'I am not the only one who taught you, Robert.'

'No! there is Lady Frances. Well, I owe it you that I have learned what a woman may be. I owe it to you. How could I know before to what heights a woman could rise? Good heavens! How could I know?'

'Very little, truly. You remember, however, that you never gave yourself the trouble to inquire into the subject.'

'I had no chance. There is a woman! Clever, accomplished, full of resource, of gracious manners. Good heavens! George—and you could go away, leave her, and come down here.'

'Beautiful too, if you ever think about beauty,' I added calmly.

'I never do, when I am in her society.' He meant well, though the compliment was doubtful. He meant, I suppose, that the charm of her conversation was so great that he could think of nothing else.

'Some men think her extremely beautiful; I do myself. You may remember also that she is well born, and rich.'

'I would rather not remember those points,' he said shortly. 'I would rather not remember that there are any barriers between us.'

'Are good birth and fortune barriers? Not always. However, there is one barrier of your own making, Robert. She is sitting in the house over the way at this minute.'

He took up a handful of chips and began to throw them into the river one by one, with gloomy countenance. 'A barrier of your own making, Robert. I suppose you can unmake it if you like.'

'My word is passed.'

'You belong to society now, you much promoted person. When you marry, your wife must belong to society as well, or you will have to go out of it. Do you think that Isabel is ready to take her place in the world of society as well as—say—Lady Frances?'

Robert, to those who knew him, betrayed any strong emotion by the quick change in his face. It was disgust, plain disgust, which crossed his face when I put this question.

'Isabel,' I went on, relentlessly, 'is a girl with many graces.'

'I have never seen any,' he said.

'Of great beauty; of great delicacy of mind; sweet and gentle.'

'So is a doll.'

'You have never even tried to discover the soul of the girl whom you have promised to marry. I know her a great deal better than you.' That, at least, was quite true, yet not exactly as he thought. 'The point is, whether she has the training and the knowledge required by a great lady in society. And I am quite certain, Robert, that she has not.'

'My word is passed. But'—He threw all the rest of the chips into the stream and got

up. 'I am not going to marry yet awhile. Not for a very long while yet.'

'Well, but consider—is it right?'

'Does she want to marry somebody else, then? Let her speak to me if she does. And how can I talk of marrying yet?' he added irritably. 'Nobody knows better than you what my resources are, and I haven't got my foot upon the lowest round of the ladder yet.'

'Let Isabel go then.'

'I have passed my word.'

I said no more. It is always a pity to say too much. We went over the way and had tea.

The day after this conversation, he addressed his constituents, not defending or excusing his conduct in ceasing to be an Independent member, but giving them his reasons in a lordly and condescending manner, which I believe pleased these honest fellows much better than if he had fawned upon them. Who would not wish to be represented by a man who had opinions of his own rather than by one who pretended to accept the imaginary opinions of the mob? 'You fellows haven't got any opinions,' said Robert, standing on the platform. 'I have. You send me to represent my own opinions, which you know, and not yours, which you don't know. Opinions? How can fifty men be said to have an opinion? Well: you all hold certain opinions that belong to simple law and order. You know that politicians are necessary; you think that rich men get too rich; you sometimes think that there ought to be work and wages for everybody; some of you allow yourselves to think what is foolishness, that wages ought to be always going up. What is the good of such an opinion as that?' And so on, telling them very plainly that he thought nothing at all of their intellects. And they liked it.

After a week, during which we saw very little indeed of him, he went away again, with scant leave-taking. He carried away with him all his possessions—his books, his papers, and all; so that it was manifest that he meant to return no more. In fact he came again once and only once, as you shall hear.

'Has he said anything, Isabel?' I asked anxiously.

'Not a single word. I was horribly afraid that he would. Not one word.'

'It is wonderful,' I said, looking upon this sweet and lovely maiden. 'Well, Isabel, the day of redemption draweth nigh. Yet but a little while, and I shall knock the fetters from your feet, and you shall be free to fly—to soar—to scale the very heavens in the joy of your freedom.'

So we were left alone again, having the quiet house, so quiet when all the workmen had gone home, all to ourselves, with the Captain to take care of us. It was not an unhappy time, despite that betrothal which I fain would snap asunder; partly because we were together, and partly because I was certain that the promise must be broken as soon as Robert understood himself a little better. The evenings grew too short for more than a sail on the river; then too short for that: we spent them at home by ourselves. Isabel discovered that I could sing; or she played to me with a soft and sympathetic

touch, which made one dream things unutterable. On Saturday afternoons we went to picture-galleries, and to theatres and concerts—always somewhere. On Sunday morning, if it was fine, we went to St Paul's, or Westminster, or the Temple, where the voices are sweet and pure, and the singing is regulated. When it was wet, we went to St John's, our own parish church, and sat under the tablets of the Burnikels. I never really enjoyed family pride at the West End; here, on the spot, one felt every inch a Burnikel. We were like Paul and Virginia; and Paul was a most enviable person. I had brought my lathe from Piccadilly and set it up in the study, and Isabel would sit reading while I made the splinters fly. Or we read together; I read aloud while she worked; or she read aloud while I took a pipe. Or, best of all, she sat opposite me while I had that pipe and talked—talked of things pure, and sweet, and heavenly, insomuch that the heart of one who heard glowed within; at such time I loved to turn the lamp low so that the sweet face of my mistress might be lit and coloured by the red fire in the grate, or the lamp in the street.

It was for his sake, in order to advise him, that Frances continued to live in town till the end of August, and when she went down to her country-house, he went too as one of the party.

'Robert,' she wrote, 'is staying here. He does not go out with the men shooting. I suppose that he cannot shoot. He works in the library: he has brought some books of his own here: he is writing a little series of three letters for the *Times* on one of his own subjects. He has read them to me first: I find them admirably expressed and models of good sense. He grows every day, George: his head will one day touch the skies. He still lacks the one grace that will complete his oratory if he arrives at it—the grace of lightness. He can be light and humorous on occasion, but his general tone is serious. It is a seriousness which sits well upon a young man, because in this age of badinage and cynicism, no one is serious, except Robert himself, who looks as serious as a Dean. There is also something on his mind. I do not suppose it is the want of money, because you told me something about his affairs: and I believe that he has a few hundreds. It is not disappointment, because no young man has ever got on so well in so short a time since the days of Pitt. I think he will be Pitt the Third. In that case, you will see him in the Cabinet in four or five years at the outside. It is not that he feels himself out of his element in this country-house, which is, I suppose, rather a finer house than the one you have at Wapping. Nothing dazzles him: neither wealth, nor troops of servants, nor titles, nor women in grand frocks, nor diamonds. What then is the matter with him? If he were another kind of man he would long since have got himself sent away by making love to me. As you know, George, I am always sending them away for this very sufficient cause. But this man does not make love. What is on his mind? You who know him may be able to advise upon this subject. The symptoms are a tendency to

the gathering of a sudden cloud upon the face; a disposition of the mind to wander away, out of sight, so to speak; a sudden looking forth of the eyes into space. He is thinking of something disagreeable. It cannot be his past, because he is no more ashamed of having been a boat-builder than you are of becoming one: though what is honest self-respect in one case, is disgraceful abandonment of caste in the other. What can it be? I suspect—nay, I am sure—that there is some woman in the case. Has he early in youth made a fool of himself with an unworthy woman? Has he trammelled himself? Is he, perchance, a married man, and married to Awfulness and Terribleness? Oh! the having to marry such women! I am very much concerned upon this point, George. Let me know about it, if you can. Don't try to screen him if he wants any screening. I think so much of him, I tell you beforehand, that I would forgive him if I could. Only there are some things which must not be forgiven.

'I am not going to stay here after October, when I shall return to town, and to dear delightful politics, and to you, my dear George, if you can tear yourself from your abominable chips and come to see me. Have you developed more callosities on your hands?—F.'

What was on Robert's mind? Well, I think I could tell her. But should I? Would it be best to tell her?

(To be continued.)

CARPETS OF CORK AND OIL.

At first sight, cork and linseed-oil seem most unlikely materials for making carpets, yet no less than twelve million yards of linoleum, consisting almost entirely of these substances, are produced every year. At a recent meeting of the Society of Chemical Industry, a most interesting paper on the manufacture of linoleum was read by Mr Walter F. Reid, F.C.S. The industry is almost entirely British, and has only been in existence for about thirty years. The first step towards linoleum was the 'cere-cloth,' made of linen or canvas, coated with wax, used principally as a wrapping for dead bodies. This practice is very ancient, and was employed extensively by the Egyptians in preserving their dead. Even to this day, oil cloth is called *wachstuch* in Germany, and *toile cêrêe* in France. Although there is considerable dispute as to when oil was first employed in painting, there is no doubt that it was used in this country as early as the reign of Henry III., for the account-rolls in the archives mention painter's oil, which at the end of the thirteenth century was worth a shilling a gallon. Certainly it was employed all over Europe towards the end of the fourteenth century. In his paper, Mr Reid quoted, from the account of a foreigner travelling in England in the fifteenth century, who described the way artists went to work in those days. The canvas was laid upon the floor, and the colours were applied to it in that position. The

traveller takes special note of the fact that the English painters were in the habit of *keeping their feet clean*. Mr Reid suggests that to this habit of keeping our feet clean, the invention of linoleum may be due. The first use of cloth treated with linseed-oil was for wall coverings and for windows, for in 1636 a patent was granted for 'painting with oyle cullors upon woollen cloath, kerseys, and stufes, being pper for hanging, and alsoe with the said cullors upon silk for windowes.' The next step was the invention of kamptulicon, which consisted essentially of powdered cork, embedded in india-rubber. This prepared the way for linoleum, which was invented about 1860 by Mr F. Walton. The industry has grown enormously since then, and the material is becoming very popular.

Considering that linseed-oil serves the same purpose in oil-painting and in making linoleum, and that cork has always been plentiful enough, it seems strange that linoleum was not thought of before 1860. This is the way with all our great inventions; they appear so very obvious when once they have been worked out. The idea may, and does occur to many people, but it is the mechanical and chemical skill that renders the utilisation of the idea possible. Although linseed is the actual oil employed, any other drying oil would serve the same purpose. A 'drying' oil possesses the remarkable property of being converted by the oxygen of the air into a stringy, elastic substance, somewhat resembling india-rubber. When employed for painting, the oil, on 'drying,' forms a cement which protects the colours from the air, and forms a water and air proof covering for the wood or canvas on which it is painted. Many oils possess drying properties in a greater or less degree; the principal ones in addition to linseed are poppy-seed, cotton-seed, hemp-seed, and nut oils. The addition of 'driers,' composed of compounds of lead, not only makes the oil dry more quickly, but renders the process more complete in the end. The linseed-oil to be used for the manufacture of linoleum is first allowed to settle, and is then boiled with the addition of driers. The next step is very curious to witness. The oil is pumped to the top of a building and allowed to flow down slowly over pieces of light cotton cloth about twenty-five feet long, suspended vertically from iron bars. The building is heated to blood temperature, and the layers of oil take about twenty-four hours to dry. As soon as one layer is dry, another film of oil is run over it, and this goes on for six or eight weeks until the thickness of dried oil amounts to half an inch. The 'skins' are then cut down and ground between rollers. Sometimes the oil is dried in bulk. The raw oil is run into a cylinder provided with rotating arms, which beat the oil into spray, so that

the drying only takes twenty-four hours, instead of several months; but the product is not considered so satisfactory as that dried naturally. The next step is to mix the ground oil with resin and kauri gum, that curious fossil resin that is found in New Zealand.

All this time machines have been hard at work pulverising the cork. Of all the difficult substances to cut, cork is one of the worst. It is so elastic that pressing on it with a heavy knife has no effect, whilst it takes the edge off the hardest steel almost immediately. Knives used in cutting cork require to be sharpened after every two or three cuts. The cork-breaker in most general use consists of a number of very strong circular saws, rotating close to steel bars, the ends of which are toothed in an opposite direction to the saws. Before reaching the breaker, the cork is passed over a deep sieve which is made to move rapidly backwards and forwards. The dust and dirt fall through the meshes, whilst the cork passes over the top; stones, pieces of metal, &c., remaining on the sieve itself. The cork is principally the waste from the factories where bottle-corks are made. Most of the cork now comes from Algeria, where there are large forests of the cork oak, and the exports from Spain and Portugal have diminished considerably. The ground cork leaves the breaker in fine powder, and is very dangerous to handle. The material is so light that it easily becomes suspended in the air, producing a highly explosive mixture. It would be safer to take a naked light into a powder-magazine than into the building where the cork is ground. All lights are carefully guarded, but in spite of every precaution, explosions are sometimes started by sparks from the machinery. Unfortunately, no means have yet been found for removing the dark patches from the cork. Everybody must have noticed these dark streaks, which consist almost entirely of tannin. They rot comparatively quickly, whilst the rest of the cork is quite sound; and if some means could be found for eliminating this dark portion, the linoleum would wear much longer.

The powdered cork is now mixed with the oil and resin cement. After a preliminary rough mixing, the compound is passed into a gigantic sausage-machine, where the materials are incorporated thoroughly. The raw linoleum, as it issues from the spout, bears a close resemblance to German sausages, and for this reason the machine goes by the name of the 'German.' The lumps of linoleum as they leave the 'German' are passed through rollers, which convert the material into sheets. These are scraped off the rollers, and the substance is then rolled on to a backing of jute canvas. Instead of canvas, wire-gauze is sometimes used, and this material embedded in india-rubber is being employed for making linoleum stair-carpets.

The linoleum made by rolling the material on to the canvas in this simple way is, of course, quite plain, and of the well-known reddish-brown colour. For producing the elaborate patterns that we see displayed in the furniture shops, very ingenious machinery has been invented. The simplest and most obvious way to obtain a pattern on the linoleum is to paint a design on the finished material in oil-colours,

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but the objection to this is that the pattern soon wears through. The next method, also fairly obvious, is to run different coloured linoleums on to the backing, side by side, so that as they are carried along by the canvas, a striped material is produced. The effect, however, is not particularly pleasing, and the public taste demands something more artistic than stripes.

One way to produce variegated patterns going right through the linoleum is to use stencils. The canvas, faced with ordinary linoleum, travels along a horizontal table, and metal stencil-plates of the same width as the fabric are lowered upon the canvas. The spaces in each plate correspond to the colour that is to occupy that particular portion, and the granulated, coloured linoleum is deposited on the plate, and brushed through the openings. The plate travels a short distance with the fabric, and then returns to its starting-point, ready to be lowered again, the patches of granulated linoleum being consolidated by hot rollers. Another way for producing a mosaic pattern is to spread the linoleum on a table, and to bring down upon it a grid, the divisions of which correspond to the outline of the pattern. Dies are then pressed on the divisions which are to retain that particular colour, and when the grid is lifted, only those that have been compressed remain in full. The operation is then repeated with linoleum of another colour, and so on until all the divisions of the grid are occupied. The tesserae or little tile-like pieces are then discharged from the grid by plungers, and consolidated by pressure. Where outlines are required between the tesserae, a stencil is used to cover up the little tiles, and granulated linoleum is brushed into the spaces between them. Yet another method is employed by Mr Walton, in which cylinders covered with knives, arranged according to the pattern, cut pieces out of a sheet of linoleum; these pieces being afterwards consolidated together.

Inlaid linoleums, as they are called, although possessing many advantages, have serious drawbacks as well. They contain so much pigment that they are not so elastic as the ordinary variety, and the compositions of the different coloured portions is so varied that they wear unevenly. Besides that, the pieces that are consolidated after being cut out from a sheet, do not form such a homogeneous mass as the granulated linoleum. Many pleasing and interesting examples of inlaid linoleum, however, were exhibited at the Society of Chemical Industry. All linoleum becomes brittle after a time. This is due not to any change in the cork, but to further oxidation of the cement. It is probable that improvements will be introduced before very long which will obviate this difficulty. The use of the stencil for producing a design going right through the linoleum seems likely to be the most fruitful in artistic results. As the Japanese have shown us, most beautiful and varied results can be produced in this manner. Plain linoleum is by no means inartistic, but has the drawback of showing marks very readily. If iron is placed on wet linoleum it leaves a black mark. This is more noticeable in the brown than in the red variety, and is produced by the tannin in the cork combining

with the iron to form ink. As regards the advantages of linoleum, it is very clean, damp and draught proof, durable, and comparatively inexpensive.

THE STRANGE ADVENTURES OF JOHN PERCIVAL.

CHAPTER V.—CONCLUSION.

WHEN John returned to his rooms, carrying his strange spoils with him, he found on his table an invitation. For the last week or two, his invitations had been few. This one had been delivered, his landlady told him, by a man and horse from Wamphrey, which was some miles off to the south of Duntrum. This was so startling in the midst of his present thoughts, that his spoils fell from his hands in the excitement of the moment. To Wamphrey! Mr Wamphrey was an invalid, the brother was absent. There had been no festivities there since his arrival in Duntrum, and that such an invitation should come now when he was about, he thought, to disclose the family skeleton, and brand its most beloved member with guilt, startled him as if there was something preternatural in it. He threw himself down in his easy-chair and tried to think, but his head went round and round.

The objects which he had carried in his hands fell on the table, and unrolled themselves as inanimate things sometimes do, as if there was life in them. They had been tightly done up, and fluttered out of the roll as they fell; the white handkerchief, folded like a bandage which had been tied together at the ends, and retained even something of the roundness of the head on which it had been bound, fell quite open, revealing its use. The larger black one had also been tied, two of the ends together. She had got rid of them on the first possible moment, trusting no doubt to the thick Spanish lace of her veil, with its large silken flowers, to disguise her sufficiently; but where did she go from that little shelter in the field—how had she escaped eventually, in the dark midnight, over the slippery, wet ground—so dark you could not see your hand held up before you, so wet and soft, your foot sinking into the clay?

John sat by his fire, and asked himself why he had been so hot in this discovery, and what he had wanted to do. Did he want to convict her, to bring her to shame, a girl who had done him no harm, who (he said to himself) had, after all, done nobody any harm; except perhaps the bank, which was impersonal and could not suffer much. It was true that it would not do to establish a precedent, and rob his Majesty's mails, when they happened to contain something disagreeable to you. But then, there were very few people in the world who would have the nerve and the strength to do that; and indeed, when you came to think, it was as much the carelessness of the guard putting such a temptation in the way, as the boldness of the culprit which was to blame. If he had not left them within everybody's reach, she would not have attempted to get them. The guilt was with the guard. Then, if he himself had kept awake and

not gone to sleep like a great baby, she would not have done it. Did he wish he had not gone to sleep? Did he wish the guard had not been so careless? Did he wish that the family should have been disgraced, and the prodigal ruined? John caught himself up with a start. What did it matter who was ruined? No one not with the purest motives, not with the most tender meaning, had a right to take the law in his or her hands. She had made herself amenable to the law—and not only so, but the position was untenable from any point of fact; it was a crime, it struck at the roots of every security. She was a thief! a thief! and of the most dangerous kind.

Suppose it had come into her head that somebody's diamonds would make a nice little portion for her brother, the prodigal whom his own family was sending away to the ends of the earth? Would that motive have saved her from the law which has to deal with a criminal and not with the crime, certainly not with the circumstances that account for the crime? He replied to himself indignantly, that there was no analogy in that case to this. To steal diamonds is common theft, to steal a mail-bag—well! That is a worse crime: and yet he could not endure to have it said even by himself. If Grizel Cochrane, who stopped her father's death-warrant so as to give him time to escape, was the heroine of the district, how was Marion Wamphrey to be called a thief? He went on reasoning with himself, wandering through the wilds of casuistry, examining, accusing, vanquishing himself over and over, and then beginning again.

Nevertheless, when he went to Wamphrey, ten days after, there were war and battle in John's eyes. He was given, as it happened, a very cordial welcome. Mr Wamphrey, the invalid, was down-stairs, seated in an easy-chair in his library, where he could take a quiet share in the amusement of the large party; and it turned out, as it so often turns out, especially in Scotland, that he had known John's father in their respective youths, which was a thing John himself had not done, having been an orphan as long as he could remember. And the elder son had come home from his travels, the object of which John was secretly aware of; but chiefly there was Marion, in the delightful position of daughter of the house, supreme everywhere—disposing of everybody, a princess at the head of her dominions. She was quite gracious to John, treating him with a sort of amused *empressment*, a smile of triumph on her face, as if to show him how little she feared him. Her manner drove John back into a conviction of the falsehood of all his sophistries, and that this bright creature was nothing more or less than the robber of his Majesty's mails, and had to be brought to justice. He was not even moved as he had been before by the thought of those little white shoes stumbling over the muddy field. This had subdued him utterly when she was not there. He could not even remember that orange skin which had appealed to him as the subtlest argument. Her smile of triumph seemed to turn his head—but the wrong way.

She had kept a dance conspicuously for him.

She was evidently intent on proving that she did not fear him. She herself proposed, after it was over, to lead him to the farthest corner of the conservatory, to show him a rare flower of which the gardener was proud: but it was there in this position of favour that John was so hard-hearted as to fire his first gun.

'I have something of yours, Miss Wamphrey, which I must take the first opportunity of returning to you,' he said.

'Something of mine? How can that be, Mr Percival? I am sure I never gave you anything of mine.'

'Or rather there are two things: a white handkerchief marked with your name, and a black handkerchief, both of which you wore round your head on a certain occasion when we first met.'

'Mr Percival,' she said, with a change of colour, 'do you think it is good taste to assail me whenever you happen to be alone with me, with this ridiculous delusion of yours?'

'They are still precisely as they were when you must have pulled them off: you know where I found them—thrust in among the roots of the rowan-trees in that little hollow under the brae. There was another thing,' said John, 'the skin of an orange.' . . .

When he said there was another thing, her eyes blazed up in sudden anxiety—then they were dimmed with as sudden a shadow of relief. She had feared something else: therefore there must be something else to find there. And then her colour came back, and she laughed out, 'The skin of an orange!' Oh, she understood perfectly what he meant! That was always what led him on. She understood every allusion. 'That was a very innocent thing,' she said; 'I would like to know how you associate me with that.'

'It gave me a kind of pleasure to see it,' said John; 'I thought to myself I was some good to her after all!'

She paused, too, for a moment, casting down her eyes, and then she said: 'I cannot really stand any longer listening to your nonsense about pocket-handkerchiefs and orange skins. I hope you yourself know what you mean. I hope you have not—lost your head altogether. I don't want to be rude and leave you—but this is more than I shall ever give you the chance of saying to me again. Mr Percival, the next dance has begun.'

'Is that all you have to say?' asked John.

'Every word—and too much!' she said.

I don't know what he had expected, or indeed what he meant at all by assailing her so bluntly, but he certainly did not make anything by it; she assumed her air of relieved triumph, but held him at arm's length all the rest of the evening; and he did not dance at all, but stood in a doorway and followed her with his eyes—always seeming to see that triumphant head, flower-crowned, issuing from the bandages, and the white shoes stumbling over the muddy grass.

'What are you glowering at?' said Maxwell, taking him by the arm. 'Mind, I warned you—no interference with me.'

'I interfere! You had better think twice before you take any step,' John said.

Then it was Maxwell's turn to glower at him.

'I hope you are not taking leave of your senses,' he said.

These two drove home together, very silent, Maxwell in great wrath at such an extraordinary warning, John consumed with a desire to betray to him the secret of Marion. He could scarcely open his lips for fear it should burst forth. A dozen times at least he had framed the words. She is not what you think. There is something I could tell. I could put her in jail if I pleased. This last came most frequently of all. I could put her—in jail. He said it actually under his breath. He repeated it over a dozen times. He could not understand why his companion did not hear him. He seemed to himself to have another motive in speaking from that which anybody would imagine. It was not to expose Marion but to test Maxwell. He thought if the fellow knew as much as he knew, he would give her up at once: and with all his soul, he wanted to put this other man to the test. I don't know how it was that the secret was kept, nor did John know. He thought it was chiefly the noise of the post-chaise.

Next day, John was very restless and excited, unable to keep quiet or to go on with his work. He had taken his hat two or three times to go out, but then reflected that to go during the day would be to call forth suspicion, and perhaps give some other person of a detective cast of mind a clue to the mystery. He was not at all himself of the detective mind, and, indeed, the thing was not known, and certainly not prized in those days. A thief-catcher it would have been called, and 'Set a thief to catch a thief' was the suggestion which everybody thought of in that connection. But he went out in the afternoon, walking sedately over the high-standing hill, and reaching the foot just as the evening began to darken. He made his way again with the same shuffling and sliding over the muddy field, and reaching the little declivity behind the rowan-trees, began his investigation. The roots were so tangled and twisted, so loosely filled up with earth and stones, that but for the clayey consistence of the soil, and the damp that penetrated through and through, he would have feared to bring the entire mound about his ears. It took him a long time, and the evening grew darker and darker, and he had almost ceased to hope for any further revelation, when suddenly the stick with which he was digging, struck upon something which gave forth a metallic sound. With a sort of fury he rushed at it again, and struggling with a shower of falling stones, and the stem of one young tree which fell upon his arm, jamming it against the side, he at last managed to extract a large article, partly metallic, which was deeply lodged among the roots of the trees. He could scarcely make out its shape in the darkness, but half by sight and half by feeling it with his hands, made sure, with a sensation which brought the blood rushing to his heart, that it was the mail-bag. He had scarcely quieted down after this discovery, when looking up from his extraordinary treasure-trove he was aware of another figure coming towards him, so near already that he

could make out it was a woman, and guess what woman it was. He started back into the shadow of the outlying edge, where he was absolutely invisible, and stood there, a spectator of the eagerness with which she advanced to the spot which he had found such difficulty in discovering, where these things had been hid. She had not even a stick, but tore at the roots and earth with her hands, plunging her arm in up to the elbow into the hole which John had made. It was now almost entirely dark, and probably she thought this was the reason she found nothing, for suddenly, before he knew what was being done, she had begun to work with one of the elaborate methods of the time for striking a light. John stood breathless, invisible, yet so near to her that he felt her panting breath, while holding his own, quite unprepared for what was to come next, not knowing what to do. He held the thing for which she was searching, he held her secret, her freedom almost, her life in his hands. Her fingers trembled, it took her a long time to strike that light—it seemed incredible to him that she was not aware at least that there was some one by.

Then suddenly the little flame awoke, and to him for a moment the whole strange little scene became visible. The light leaped up upon her face, pale with anxiety and alarm, and upon the background of the rugged bank, her gloves muddy and stained with the damp earth, a quiver in her person—though even then she was not aware of him for a moment, being so deeply absorbed in her search. Then she lit a piece of candle which she had taken from her pocket and held it to the crevice; but John was no longer able to restrain himself. He touched her sleeve softly with his hand. With a great start and subdued cry, kept down at that dreadful moment by a fear still greater than her fright, she let fall the light. She had not divined who he was—or she was of sufficient power to pretend so. She said hurriedly: 'I was looking for something I had lost: perhaps you'll help me—I'll—I'll pay you.' Her voice went out as her light had done, dropping in the dark, but leaving an impression of trembling and quivering in the air. Her terror was very real: she thought she had disturbed a tramp or beggar taking refuge in this solitary place.

'This is it, no doubt,' said John, putting the bag into her hand: this time the cry of terror was not to be repressed—and yet there was a relief in the sound: of the two, her enemy, who was a gentleman, was safer to meet in a lonely place in the dark than a tramp. 'It is you!' she cried—'you!' her teeth chattering with the fright and the cold.

'Who should it be,' said John, 'but I, Miss Wamphrey? I saw by your look there was something more here, and I came to find it. Did you expect anything else?'

She was not able to reply. He felt that she made a strong effort to regain her composure, but could not, being beyond speech. The entire darkness seemed to palpitate with her trembling. It seemed to him as if he, too, quivered with it, standing by her side. He had put the bag into her hands, but it fell out of them upon the damp ground at their feet. He put out his

hand, and gathered both of hers, which did not seem to have any strength to resist, into his hold.

'Compose yourself,' he said, 'compose yourself! It was better that I should find it than another. For God's sake, be calm! I will do you no harm.'

She had not the strength to draw her hands from his now: she was thankful for the supporting of his grip. 'I—I know what it means,' she said, gasping painfully, 'I—know what it means: I am prepared—to pay the penalty. I know that I am in your hands'—

'I think you will find them safe hands,' said John. He drew her arm through his. 'Come,' he said, 'take courage. I don't think you have ever quailed before.'

'Mr Percival,' she said, recovering her utterance a little, 'why are you my enemy? I am not your enemy—nor any one's. It did no one any harm'—

'Except the law and the bank'—he said.

'The bank—was it for the bank?' Her tone changed: her fears came back: she drew herself away. 'If that is so'—

'No,' he said, 'it was not for the bank? It was for you. I think too can keep a secret better than one, Miss Marion. And you ate my orange, you know.'

'It saved my life, I think,' she said, with a sudden low burst of hysterical laughter; and then recovering, she put her hands imploringly upon his arm. 'What are you going to do with me? Oh, have mercy upon me! What are you going to do with me?' she said.

'If you will let me, I should like to marry you, Marion,' he said.

A few days after, it happened that John was entertaining young Maxwell and a few more in his rooms, as it appeared that he was returning sooner than he had intended to Edinburgh. There was some talk among them of the great adventure which had accompanied his arrival, and they fell into discussion on the subject, what the motives of the guilty person could be, and whether it was really a woman, and what had become of her. 'It would be droll if you ever recognised that woman you saw, Percival,' said one of the young men. John acknowledged that it would be droll, though probably she had nothing to do with it: and he asked the advice of his assembled friends as to what, in such a singular case, a man should do, and various suggestions were made, which did not perhaps throw much light on the subject. They were by no means at one as to whether they would denounce her or not, always supposing it was a woman. 'Not if she is bonnie,' one said, and on the whole this was the general judgment. 'If she turns out to be old and ugly, with her head bound up, and all the rest of it, give her up—like a shot' (though, by the way, they did not say like a shot—the slang of their day was different). 'But if she is bonnie, nothing of the kind.' John went on to suggest other difficulties. What if she should be met with in Society? What if some fellow you knew was going to marry her? This made them all ponder. 'What should you do, Maxwell, if such a thing were told you of a woman you were in love with?'

'I can't contemplate the possibility,' said Maxwell with a laugh. 'By George! but it would be a ticklish position, though,' said one of the others. 'Awfully hard upon Percival, still more hard on the other fellow.' 'I would never mind if I were fond of her,' said one. 'I should mind awfully,' said another. (Be it here observed that the use of the word *awful* is not slang, but the Scottish language.) 'You might mind, or you might not mind,' said Maxwell oracularly, 'but none of us would make a woman who had done such a thing our wife.' He had not the least idea that he delivered his friend's heart from a great weight when he said these words. 'So then I am no traitor even to him,' John said to himself.

It was felt at Percival's Bank in Edinburgh, that though to marry so young might be foolish, there was not a word to be said against Miss Wampfrey of Wampfrey, and that it was a piece of good fortune that the young ass should have fallen on his feet, and made such a good connection. Marion had the opportunity, of which she availed herself quite pleasantly, of refusing Maxwell shortly after, and in spring her marriage took place. There was some story of their having fallen in love with each other over the eating of an orange, people said: and very soon after his marriage, John Percival had the satisfaction of remitting a sum of money from his brother-in-law, Will Wampfrey, in New Zealand, to the bank manager at Dundure.

THE MONTH:

SCIENCE AND ARTS.

THE construction of the first mountain railway in Britain, that from Llanberis to the summit of Snowdon, is an engineering feat which should not pass without notice, although its opening was marked by a deplorable accident, which will, we fear, for a time interfere with its popularity. The length of the line is nearly five miles, with three equidistant passing places, besides the two terminal stations. The system adopted is a modification of the Abt system, and the railway is modelled upon the Swiss mountain lines, and is almost a counterpart of the Rothhorn railway. The permanent way is all of steel, both rails and sleepers, the gauge being only 31½ inches. The route followed is that of the familiar footpath from Llanberis, but diversions are made in places for the convenience of the engineers, as well as with the object of improving the view. The lamentable accident which marred the opening of this interesting line would not have resulted in any fatality had all the passengers kept their heads, and it at least has demonstrated that the brake-power is sufficient to provide for all contingencies. There is no reason why the Snowdon railway should not prove as flourishing a concern as its prototypes in Switzerland.

The marking of foreign meat so that the consumer shall not pay for the frozen article at the same rate as for home-grown mutton and beef seems to be fraught with difficulties,

and the arguments for and against the measure are so varied that those not in the trade cannot easily follow them. What seems to us one of the best solutions of the matter is embodied in a suggestion offered by a correspondent of the *Times*, which is as follows: 'No carcass of any sheep or lamb imported into the United Kingdom in a frozen state, or as fresh meat, or slaughtered at the Foreign Animals Lairages, and no carcass of any cattle imported under similar conditions shall pass into the open meat markets with the trotters, head, hoofs, or any portion of the skin or hide attached thereto.' Such an enactment would not be difficult of enforcement, and it would enable the consumer to see at a glance what he was buying. At present, the sale of foreign meat for British is notorious, and it is a fraud upon the home grower as well as upon the retail buyer.

Inventive talent is not always hereditary, but it seems to be so in the case of the Bessemers. Anthony Bessemer, for some time connected with the English Mint, was author of many useful inventions. His youngest son, Sir Henry Bessemer, who still survives at a ripe old age, discovered the direct and cheap method for making steel from crude iron, which bears his name, and which has been followed by the Siemens open-hearth process; both have proved amongst the most widely beneficial inventions of this century. Steel has been so cheapened that it is used for many purposes for which iron was previously used, such as steel rails, girders for bridges, and carriage tyres. A process which occupied nearly ten days is accomplished in a very brief period, while the price of steel has been reduced from about £50 to £5 or £6 per ton, and the world's annual production of Bessemer steel amounts to between eighty and ninety millions sterling.

A grandson of Sir Henry's, Mr A. G. Bessemer of 27 Killiesier Avenue, Streatham Hill, London, has patented a very ingenious method for rescuing persons from dwelling-houses when on fire, and has published an account of his combined fire-alarm and life-saving apparatus. In spite of fire-brigades and fire-escapes there are an alarming number of preventable deaths by fire every year, the larger proportion of which might be avoided were some such simple system as that of Bessemer's adopted. The method is based upon the idea of allowing persons in a tenement, hemmed in by fire, a means of escape, through a direct passage, by a door of communication into the house adjoining. A fire-proof structure is embedded in the wall, which is only to be opened in case of fire. The opening is fifteen inches above the level of the floor, is three feet three inches in height, by one foot three inches wide. Into this opening is inserted the iron frame or box, containing an arrangement of steel plates, combined with a fire-resisting and bad conductor of heat, such as asbestos. There are double steel doors on each side, and each householder can open his own door only, but no one person can open both doors. This cannot be done without co-operation of persons on opposite sides of the wall. But this is provided against by the ringing of an alarm loud enough to awaken the whole tenement. In houses so provided, dwellers may sleep securely, as, if an exit is cut off by

stair or roof, there still remains this door-way through the wall.

'The digestion of an ostrich' is proverbial, but we do not remember having ever before seen such a remarkable proof of the appositeness of the reference as is furnished by a certain inventory drawn up by a New York taxidermist, into whose hands came the carcass of one of these birds for dissection. The ostrich belonged to Barnum & Bailey's menagerie, and had formed part of the Exhibition in the Central Park. In its stomach were found the following articles: The bottoms of two beer bottles; a wooden clothes-peg; a mouth-harmonica, five inches long and two wide; the ferule of an umbrella, with four inches of stick attached to it; a metal skate key; a door key, five inches in length; a woman's hair-comb; two pieces of coal; a silk handkerchief; three stones; together with a mass of cabbage, grass, and dirt which served to fill up the gaps. Strange to say, this strange assortment of food had nothing whatever to do with the death of the bird. It died of another kind of consumption—tuberculosis.

Colonel F. Spratt recently read a paper before the Camera Club, London, on 'Elephant-hunting in the Nepal Terai,' illustrating his remarks by photographs which were taken with a hand-camera from the back of an elephant. Colonel Spratt is one of very few Europeans who have had an opportunity of joining in this magnificent and dangerous form of sport. The enterprise is organised for the amusement of the Maharajah, and takes place only once in about four years, else the forest would be denuded of the big game. A small army, consisting of about five thousand men, and perhaps three hundred elephants, and a few horses, take part in the hunt, and they carry tents and provisions just as if a campaign against a powerful enemy were in progress. When the pad marks of an elephant are found, he is steadily tracked down, and as soon as he is found, a trained fighter of his own species is urged against him. As a rule, he steadily retreats upon sight of his pursuers, and their object is to press him so as to tire him out. He then stands at bay, and the tug-of-war commences. The opposing animals butt at one another with the heads down, and should one show his flank, he is quickly brought to earth. When finally conquered, the wild elephant is pressed by his pursuers towards water, of which he is so much in need after his exertions that his hind-legs can be shackled as he drinks. He is then kept attached by ropes to other elephants until he gradually gets accustomed to bondage, and in a few months he is completely under control. The sport is a bloodless one, and the elephants when captured are most kindly treated.

Much has lately been heard about the electric furnace, and the wonderful new products which it is placing at the service of mankind, but very few have had an opportunity of seeing the apparatus in action. Much interest was therefore excited when Professor Dewar showed the furnace at work at the Royal Institution in his opening lecture upon the Advances of Modern Chemistry. The furnace consists of the familiar carbon rods as used in the electric arc light—only they are surrounded with fireclay, and

the upper one dips into the crucible in which substances under fusion are placed. Perhaps the most interesting thing shown was the production of calcium carbide. The furnace being fully aglow, small charges of lime and carbon were fed into the crucible, and after a time the product—calcium carbide—was exhibited. This dull, black mass, when dropped in water, gives off acetylene gas, which burns, as already noted in our columns, with a luminosity eight times that of the best coal-gas.

The Secretary of the Electric Construction Company points out in a letter to the *Times* how our manufacturing industry, as well as the farming interest in this country, is suffering from the legal obstructions which exist to the development of transport by electric traction and horseless vehicles. If our engineers had free scope for their inventive faculties, instead of being bound by the provisions of the Locomotive Acts, we should now be carrying a volume of traffic on our highways by mechanical means, at a cheaper rate, and with far less wear and tear than with horses. We took the lead in the development of railways, but now that a new order of things is coming about, we are letting foreigners step in to secure a monopoly. Germany and America are providing plant not only for South Africa, but for England and Ireland. The advantages of this new form of traction are many. The vehicles occupy a smaller area than carriages with horses; with rubber tyres the wear of the roads is reduced to a minimum; there is no noise, smoke, ashes, or droppings, and they are more effectively controlled than ordinary horse carriages. The limitations at present placed on the development of what promises to be a lucrative industry, call for immediate legislation.

Mushroom cultivation in France is a very important industry, no fewer than sixty wholesale firms in Paris alone devoting themselves exclusively to the sale of this delicious vegetable production. In the latest issue of the United States Consular reports, are four from Naples, Bordeaux, Marseilles, and Paris, dealing with the entire industry, the first-named report giving the most details. In the Department of the Seine there are said to be more than 3000 caves, principally exhausted stone quarries, connected with the upper earth by rope-ladders, in which mushrooms are grown. In these caves live about 300 people, who attend to the cultivation, and rarely see daylight. The conditions for successful culture seem to be a cool and even temperature, absence of light, or at least of sunshine, a current of air in one direction—preferably from north to south—and change of soil when a bed is exhausted, that is, after about three months' yield. If these and other precautions be adopted, a continuous supply of mushrooms can be confidently reckoned upon throughout the year.

In a recent lecture upon 'Water-power and its Application,' Professor Capper of King's College pointed out that at the present time the greater part of our industrial activity was dependent upon coal for its motive-power. The supply of this fuel—which owed its origin to the power of the sun in past ages—was by no means unlimited, and the exhaustion of our coalfields not quite so remote as some might think. A

very valuable substitute for coal was water, the stored-up energy of which we also owed to the power of the sun, for by the action of the sun the evaporated moisture from the earth and seas rose in the atmosphere, and was afterwards condensed as rain, which was continually flowing from the hills into the lower lands. If the force of the rivers thus fed could only be utilised, the whole of the motive-power required for our industries would be provided. There were three ways in which water-power could be made available for use. First, the weight of water might be made to turn a wheel in the familiar water-mill fashion; secondly, by means of the hydraulic ram, or piston; thirdly, by using a vertical tube, from the bottom of which the compressed fluid could be urged in a jet against the vanes of a paddle-wheel. It was this last device which was adopted at Niagara, and if the whole of the force generated by that mighty waterfall could be made available, about 10 million horse-power would be at disposal—sufficient to drive 500 Atlantic liners continually at the rate of 20 knots per hour.

It was stated at the annual meeting of the members of the National Sea-fisheries Protection Association, that during 1894 the amount of fish landed in the United Kingdom was larger than in any previous year, the money value of the fish being nearly seven millions sterling. But the increase was not derived from the home fisheries, but from the increasing proportion of the fish-supply from around Iceland. The bill introduced last year for putting a stop to the destruction of immature flat-fish unfortunately did not pass, but a similar bill would be introduced by the Government which would deal with the subject. Belgium and Denmark had already legislated in this direction, and we should certainly not be behind in a matter which was of international importance.

The great importance of the Röntgen method of obtaining photographs of the inner structures of the body has been evidenced by several examples which have recently been brought under our notice. In one case a little child in crawling about the room was heard to occasionally scream without any apparent cause. Examination revealed a slight swelling in the leg, and a doctor suggested that there might be a needle there. The child's leg was placed under a Crookes tube, and on a photographic plate, with the result that a needle was plainly shown, and promptly removed. In another case, disease of one of the bones of the forearm was indicated, but the extent of the mischief was not known until revealed by one of these strange Röntgen pictures. It was then found that while one bone was entire, the other was perforated in several places. The doctors, indeed, were able to find out as much about the case as if the diseased bone had been laid bare. These cases were shown to us at Faraday House, London, where a complete X-ray plant has been established for the benefit of doctors and their patients.

Any one who wishes to study English History in a most entertaining way is recommended to take the first opportunity of visiting the newly opened National Portrait Gallery at Charing Cross, London. Here can be seen the counter-

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feet presentments of all who have made history for the last few centuries, including great soldiers and sailors, statesmen, painters, doctors, besides many whose lives have not been of so creditable a kind. In addition to the pictures there is a collection of effigies—mostly of kings and queens—which have been copied by the electrolyte process from statues and busts which are for the most part dispersed among our cathedrals and abbeys. The effigy room is really one of the most interesting features of the new gallery, and an inspection of it would alone repay the trouble of a visit to it.

Yet another use has been found for the ubiquitous Photographic Camera by Mr Mallock, who has found it a most useful agent in determining whether the lines of a building are vertical, or whether they have from any cause ceased to be so. It is true that such a question can be solved in other ways; but such methods are tedious, and involve both trouble and expense. Mr Mallock's plan is simple in the extreme. He places his camera on a horizontal board, and in front of the lens he arranges a small tank of glycerine and water, which forms an artificial horizon. By this means, the building, whose verticality has to be tested, is photographed together with its reflection in the tank, as in a looking-glass, and every deviation from the perpendicular can afterwards be detected on the negative produced by means of a micrometer scale; a true vertical being obtained for comparison by a stretched silk fibre across the plate. Mr Mallock recently lectured upon this new application of photography, and showed various examples. In one picture, taken at Westminster, it appeared that the clock-tower was slightly out of line, while the much older abbey, and St Margaret's Church, were as true as when they left the builder's hands.

When Professor Graham Bell showed, nearly twenty years ago, that actual speech could be carried from one distant point to another by means of a communicating wire, he aroused the wonder of the civilised world; but for a long time our postal authorities regarded this invention as a mere toy, and treated it with lofty disdain. When, however, a company put his system into practice, the Post-office saw that it threatened their revenue, and obtained a judgment from the courts declaring that the telephone was a telegraph, and that those using it infringed the Government monopoly. Since that time, the telephone has been worked under Government license. A new order of things will now prevail, for the Government have bought the telephone trunk-lines—that is, the wires which connect one town with another—and the result of this arrangement will be, that presently the public will have many benefits in the way of quick communication placed at their disposal. Each post-office will have its call office, connected with the existing exchanges, so that correspondents may communicate with one another for a small fee. A subscriber to the exchange will have the additional advantage of summoning from the nearest post-office a boy to carry express letters or parcels, or he can speak a message to the office, which will then be transmitted as an ordinary tele-

gram. The amount of business already transacted in our large towns by telephone is enormous, and will be greatly extended when the new system comes into play.

A MIDNIGHT ATTACK.

By the Author of *The Rising of the Brass Men*.

BEHIND the Colonies and Protectorates of Great Britain and France, which extend in a broken line along the West African coast, from the mouth of the Gambia to the Niger, lies a wild and little known region of swamp and forest, where but few white men have ever set their foot, inhabited by many Negro races, differing widely in physique and language from one another. For the last few years, strange stories have been brought down to the seaboard about the doings of an Arab chief, called Samory. The latter, at the head of a large following of desperate men, attacks from many tribes, Mandingoes, Jalufs, Sofas, Senegalis, and deserters from both British and French native troops, has made his name a terror throughout this 'Hinterland,' sacking villages, and carrying away the inhabitants into the far Soudan.

During 1893 he raided the eastern portion of Senegal, and the French lost a number of white officers in the hard fighting necessary to drive him out. More than once, too, they were badly beaten, for their assailants were armed with high-class rifles, smuggled through from the coast, in spite of certain clauses in the treaty of Brussels.

If the reports of native traders from the interior are to be credited, Samory has been busy during the last twelve months, and has fought many battles with inland chiefs far to the north. Exactly where he may be at present is not known, even to the European Frontier officers, who are by no means anxious for his reappearance.

However that may be, in the latter part of 1893 this Arab leader induced the Sofas, a warlike tribe, dwelling in a debatable land between the small British colony of Sierra Leone, and the French territory of Senegal, to take up arms against the Europeans; and quite unknown to each other, a British and a French expedition marched from different points to attack him.

One afternoon, at the end of December in that year, a small British force, comprising detachments of black Mohammedan Haussas of the Frontier Constabulary, and Negroes of the West India Regiment from Sierra Leone, stumbled through the dense forests of the Conno country. The day had been intensely hot, for this is the dry season in West Africa. From every foul lagoon and sluggish river, which lay shimmering in the fierce sunlight, sickening exhalations rose into the tainted air; while as the long, hot hours wore away, and evening approached, a white steam-like mist covered the surface of the damp, hot earth.

The tired troops dragged themselves painfully along, with a company of Krooboy bearers ahead, slashing a pathway for them through almost impenetrable thickets, beneath the wide-spreading arms of acacias, baobabs, and lofty

cottonwoods; or floundered amid the mangrove roots, in peril of disappearing altogether in the slime, as they forded the numerous forest creeks. At sunset they reached a small clear space, surrounding a deserted village, and there, at the word of command, the worn-out men were glad to pile their arms, and prepare to camp.

A rough breastwork of brushwood was soon arranged in a hollow square, and throwing themselves down on the moist earth, amid the crimson shoots of trailing plants, and flowers of many hues, the soldiers spread their simple meal; the tall Haussas in their crimson fez and dark rifle uniform separating themselves from the men of the West India Regiment, for the latter profess a debased form of Christianity mixed with black practices, and the true Mussulman will not, if he can help it, eat with the infidel.

By-and-by the light grew fainter and fainter amid the trees, and then died out altogether. The moon swung slowly westward and the stars shone down out of a sky of deep indigo with an intense clearness, for in the tropics the eye realises the immensity of distance between each of these twinkling points of fire, which stand out so sharply, one behind another, in a kind of stereoscopic focussing through an endless perspective of space.

The colonel's tent shone through the damp bushes like a big Chinese lantern. Inside, the light of a swinging hurricane lamp fell on the thin yellow faces of the white officers, seated round a strip of palm netting, on which were spread sundry tins of provisions, and the inevitable whisky and Sauerbruner. The mark of 'the coast' was on them all; the wasted figure and listless air which unmistakably stamps most European dwellers in the feverish West African littoral.

An hour or two was passed in spiritless chat, for a long march through a tropical forest sickens both mind and body. Then, posting sentinels, and leaving one white officer on guard, the rest rolled themselves in their blankets, and went securely to sleep, for according to native reports, Samory and his raiders were still far distant.

The young West India lieutenant on guard leaned against the great buttress-shaped roots of a cottonwood, and as he mopped the perspiration from his brow, and fought the blood-thirsty mosquitoes with both hands, said wicked things about the fate that led him into 'this distressful country.' He was an Irishman, and when he abused things in general, as Frontier officers occasionally do, the powerful eloquence of the Celtic tongue relieved his feelings best. From time to time he looked out into the darkness, but there was little to be seen; the shadow of the trees closed round the camp like a wall, and no sound other than the usual night voices of the African forest broke the stillness. From a hidden creek came the floundering and splashing of an alligator; at times the branches of the cottonwoods rattled, as a monkey swung himself from bough to bough; or the rustling of grasses marked the passage of a huge snake.

The white man at last found the spell of the forest, which at times will cause a panic even

among the natives, though no one knows why, creeping over him. His hands trembled as he settled the chin-strap of his pith helmet. 'Pah! how this night-watching gets on one's nerves,' he said; 'it shows what the climate will bring a man to. Even the "drip, drip" of the water there is enough to drive me mad—Hallo!' He sprang back, with a hand on his revolver butt, as a dark figure rose up out of the bushes beside him.

'Sergeant Amun Sah,' said a tall Haussa, saluting; 'think there be Sofa man in the bush; monkey frightened live for go away, leopard live for go away too.'

The lieutenant listened, while the veins tightened across his forehead, and something seemed to click beneath his right ear: and sure enough a rustling amid the trees announced the passage of a troop of monkeys, while the long howl of a leopard drifted down the night breeze.

A few moments later, all doubt vanished, for a snapping of twigs and swishing of leaves told that a large body of men were advancing through the forest.

At the report of the lieutenant's revolver, the camp awoke, and for a few moments, while the bugles rang out the alarm, there was a scene of wild confusion. Men still half asleep stumbled over one another towards the stockade; officers ran here and there with sharp words of command, while the Haussa sergeants effectually aroused any laggards with the rifle butt. If the soldier was a West Indian, the hint was even more vigorous. Then out of chaos came forth order. Lines of men knelt beneath the brushwood screen, supporting their rifle barrels on the branches against the downward drag of the bayonet, while the colonel moved coolly up and down, revolver in hand, and saw that all was ready.

Just in time, for an outburst of howls and yells rose on the night air; a crackling blaze of rifle fire ran round the bush, and while the bullets sang overhead, or ripped through the leafy screen, a swarm of dark figures dashed across the open space towards the camp.

'Fire volleys by half-compnies,' shouted the colonel, as his heart bounded and the blood surged through his body.

'No. 1 Haussas—fire,' the voice of the Constabulary captain sounded clear and distinct, and a blaze of light burst from one side of the stockade, while the crashing report of a volley rang out through the darkness. Before the sound had died away, a West India lieutenant, farther off in the gloom, re-echoed the command, 'A Comp'ny—fire!' and a sheet of flame blew along the two ends of the square.

Before the almost simultaneous discharge, the front of the attacking force melted away. Men lay writhing amid the wet leaves, or crawled on hands and knees through the bush; but the Mussulman, with visions of black-eyed houris and the tree of Sedrat before his eyes, has little fear of death, so with loud yells the foe spread out, and at full speed made for the breastwork.

'Independent firing—commence!' roared the colonel, and after captain and lieutenants repeated the order, the Haussas, who, used to Frontier

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warfare from childhood, think themselves marksmen, took snapshots at the flitting figures, but did little harm beyond clipping clusters of leaves from overhanging cottonwoods. Meantime the West Indians, who are accustomed to drill in battalions, and fancy they are quite equal to white infantry, after a desultory shot or two, stood silent with bayonets at guard. Next moment the assailants swept at the defence, only to be met by a glistening wall of steel, and for a short space both sides were locked in a deadly struggle, the officers working their revolvers until the barrels were hot, while the troops fired as fast as they could thrust in the cartridges. Nothing human could face the murderous rifle blast, and in a few seconds the foe broke away and fled to the bush.

For a while, the smoke hung heavily over the camp on the damp air, then slowly melted away, and as the colonel recovered his breath he felt his wrist burned by the back spitting of his heated revolver.

'That was sharp work, lieutenant!' he said to the young officer of the West Indians. 'We shall have breathing time now, and then they will come back. How have your men come out of it?'

'At least two dead, sir, and more wounded; but the Haussas got it worse than we did,' was the answer, as the colonel passed along the line.

An hour went by, minute following minute, slowly—very slowly, as the shadows of the cottonwoods crept across the clearing, for the moon was sinking behind the Western forests. The shimmering silver patches on the grass narrowed and shortened, but still much of the camp lay bright and clear in the light. Here and there a wounded Hausa moaned faintly as he struggled to repress a cry that would have been unworthy of a believer in the Prophet, while the West Indian, who possesses neither the resignation of the Christian, nor the heathen's contempt of death, groaned over his hurts, or hurled horrible curses at the heads of the invisible foe.

'Silence, men!' said their lieutenant sternly, while the Constabulary captain smiled as he remarked: 'Those fellows of yours are good to fight, but they have not the stamina of mine. The moonlight's going; still if these brutes come back, they could pick us off man by man, if they were only able to hit anything; as it is, we shall get it hot; the woods are full of them.' Then he grasped the shoulder of his friend, and thrust him forward into the shadow, as a line of flame burst out of the bush, and a flight of bullets passed over the heads of the crouching men.

Without waiting for the word, No. 1 Company of the West Indians fired a volley, but as the smoke wreaths blew in the men's faces, a mocking yell from the forest told that it had done no harm, while with a rattle the troops turned over the Sniders to shake out the empty shells.

'Independent firing—commence!' the officers shouted, and the men, crouching beneath the frail defence of the breastwork, fired at the flash of their assailants' pieces, with probably little result, for the forest was dark, while the line of branches which defended the British front

was clear and distinct, and the blue barrels glinted in the moonlight. From behind every cottonwood root and wide baobab trunk bright gleams shot out. Every now and then a soldier dropped his rifle with a clatter, and collapsed, a moaning heap, amid the wet undergrowth, until the men's hearts grew sick as they realised how they were at their opponents' mercy, and they longed for the dawn, when they should meet their skulking foe face to face.

It was one thing, the West Indians thought, to stand back to back, and face any odds in the open; but to see a comrade by one's side loosen his grasp on his weapon and roll over, tearing at the leaves, or lie still, and cough away his life's blood, and be able to do nothing but be still and bear it, was a very different matter. So the men fidgeted and muttered until the colonel realised that if this kind of thing went on much longer, they would be beyond all control.

While the officers, with smoke-grimed faces, and dried-up throats, walked up and down the line, exposing themselves recklessly to the desultory firing to encourage their men, there was a stirring in the forest, and presently, in grim silence and spread well out, the foe rushed towards the camp.

'Steady, men—steady—wait a little!' roared the colonel, as with overstrained nerves a few of the soldiers pulled their triggers, and the bullets tore up the grass harmlessly a few yards ahead.

'A Company, fire—ready No. 2!' shouted the lieutenants, but the men were now past all control. They had their comrades' blood to avenge, and shouted and yelled as they thrust cartridge after cartridge into the chamber as fast as they could turn the Sniders over. The fever of the fight was on them, for now they felt their time had come after the weary waiting.

'Meet them with the bayonet!'—the colonel hardly knew his own voice, it sounded so hoarse and cracked—then he gasped, 'Good heavens! what was that?' for above the rattle of the rifley the words 'Courage, mes braves!' rang out sharp and clear through the smoke.

Dropping his smoking revolver, he sprang among his men, shouting 'Cease fire!' but the hammering of the Sniders drowned his voice, and the acrid smoke choked him, and he stood in silent horror and watched the fight. It did not last long. The swarm of savages had not nerve to rush upon the unbroken line of flashing bayonets—they turned and fled from the impregnable breastwork. Then came the turn of the defenders, and with hoarse shouts the West Indians leapt over the brushwood, and with dripping bayonets drove the foe through the forest.

The colonel sat down with his back to a tree, a horrible fear in his heart, and longed for the dawn as he had never longed for anything in his life. Fortunately, there was not long to wait, for the suspense was deadly. The shadowy palm fronds sharpened into shape; a soft gray light, growing rapidly clearer, filtered through the overhanging branches, and a broad crimson streak appeared over the forest; then morning came suddenly, as it always does in the tropics. The colonel looked round; the enemy had gone, leaving only dead and wounded, but his first care was to see after his own men.

Three white officers and a sergeant-major of the West Indias had fallen at their posts, with faces towards the foe. Six privates were killed, and a score badly wounded, and the colonel groaned, as with dry lips and contracted brow he recognised the pity of it, and the uselessness of this waste of life; for there was worse to come.

The bright sun-rays fell on the scene of the fight, and the gloomy forest-clearing became at once a place of warmth and light; but the space in front of the square was dotted every here and there with a rigid, motionless figure, and the surrounding bushes were full of wounded men. For a few moments the officer hardly dared go forward and examine the slain, and when at last he slipped over the breast-work, and stood over the quiet dead, the sight was what he expected—they were not Sofas.

Many were naked savages, auxiliaries only, but ten of the chief assailants lay there with distorted features, clad in the uniform of the French Senegalais. The colonel wondered who would be called to account for this night's work; but the crowning horror of the whole affair was reached when four Haussas carried in a white officer, and laid him on the dewy grass, coughing up gulps of blood.

He smiled as an Englishman raised his head, and he saw the pitying faces bent over him, for the defenders had already solved the riddle; then gasped, 'Hélas, mes amis!' and swooned away.

A few drops of spirit were poured down his throat, and then after a while the eyes reopened and he murmured the story, how, deceived by a native chief Koronah, he supposed the British force to be Sofas, and did not find out the mistake until too late.

'There—there, that will do, don't fret yourself; it's a ghastly thing, but it can't be helped—take another drink and go to sleep,' said the surgeon. The Frenchman swallowed a mouthful of the liquor, then his speech wandered, and his eyes grew hazy. 'Poor fellow,' said an English officer, 'it's a gone case, but we must do what we can for him; take him to the tent, sergeant.'

It would have been an instructive lesson to the coloured editors of the *Sierra Leone* journals, who are fond of declaiming against 'the dissolute soldiery,' to have seen an Englishman seated by the side of his late foe, moistening the black parched lips from time to time, and wiping the perspiration from the hot forehead. The commanding officer came round occasionally, and the last time the younger man raised his hand for silence, 'Hush, he's coming to,' he said. The white lids opened, and a faint smile shone in the tired eyes as the wounded officer raised his head; he stretched out a cold hand, which felt like ice when the Englishman took it.

'Adieu, mes amis—je vous souhaite un meilleur sort,' he gasped, then broke off and choked; a stream of dark blood stained his white uniform, and he sank back, dead.

This mistake, caused intentionally by the treachery of Koronah, who was duly hanged for it afterwards, cost the lives of four officers, who could be but badly spared, besides numerous privates and auxiliaries, and forms one of the dark pages in our West African history. Yet although the details seldom reach the ears

of Englishmen at home, the deeds of our Frontier officers, amid the dreary swamps and forests of the debatable land, where our colonies abut on the wilderness beyond, are such that the nation has cause to be proud of them.

By hidden ambush, facing savage foes, or stepping calmly, man after man, into a dead comrade's place, so that the disease-stricken station may not be left for a single day, district commissioner and soldier daily lay down their lives. When we hear of eleven officers dying, one after another, at the same post in nine months, and yet none hesitated to go; and of three men holding 800 savages at bay through a long night, it is not hard to realise that the West African legion of honour is a long one, and that the supremacy of Great Britain in that fever-haunted littoral is dearly bought with British blood.

WAITING.

GOLDEN Summer and glowing wood
And shining leaves o'erhead,
Mazes of verdure and blossom
And fair green moss to tread.

Who should be gayer than I!—but no,
I wait and my heart is sore,
Listen and wait for a bird to sing
That sang in the wood before.

What though the rich air quiver,
The waters sparkle along,
What though the cushat is cooing,
I am waiting for that one song.

Waiting and listening and longing,
Summer is shining in vain,
Waiting and listening and longing
For the song of that bird again.

But I know that if one bright presence
Adown the pathway drew near,
That bird on the instant were singing,
The whole of my world were here.

T. P. JOHNSTON.

The July issue of *Chambers's Journal* will contain the opening chapters of a New Novel, entitled

A LOCAL VIEW.

By P. L. M'DERMOTT,

Author of *The Last King of Yewle*, &c.

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